

Name: **AAAAAAAAAAAA**

Student id:

Sect#: #:

UNIVERSITY OF BAHRAIN **COLLEGE OF INFORMATION TECHNOLOGY**
DEPARTMENT OF COMPUTER SCIENCE **1st SEMESTER 2014/2015**

ITCS 242: ASSEMBLY PROGRAMMING

DATE: NOV 20, 2014

FIRST TEST

QUESTION ONE: Write a complete assembly program that: [20 pts]

- Defines an array CAT consisting of 32 elements of signed words.
- Randomly generate 32 words and store the generated values in array CAT.
- Displays in HEX all elements of array CAT as bytes separated by a space.
- Subtract 400H from each element of array CAT.
- Display all elements of array CAT in signed decimal separated by semicolons.

```
                INCLUDE Irvine32.inc
                .DATA
CAT             SWORD      32 dup(?)

                .CODE
MAIN           PROC
                CALL        RANDOMIZE
                ; Generating random numbers and storing them in array CAT
                MOV         ESI, OFFSET CAT
                MOV         ECX, LENGTHOF CAT
L0:            CALL        RANDOM32
                MOV         [ESI], ax
                ADD         ESI, 2
                LOOP        L0
                CALL        CRLF
                ; Display elements of array CAT as bytes (HEX) separated by space
                MOV         ESI, OFFSET CAT
                MOV         EBX, TYPE CAT / 2
                MOV         ECX, LENGTHOF CAT * 2
                CALL        DUMPHEX
                CALL        CRLF
                ; Subtract 400H from each element of array CAT
                MOV         ESI, 0
                MOV         ECX, LENGTHOF CAT
L9:            SUB         CAT[ESI], 400H
                INC         ESI
                LOOP        L9
                ; Display all elements of CAT in signed decimal separated by ;
                MOV         ECX, LENGTHOF CAT
                MOV         ESI, 0
L2:            MOVSD       EAX, CAT[ESI]
                CALL        WRITEINT
                MOV         AL, ";"
                CALL        WRITECHAR
                INC         ESI
                LOOP        L2
                CALL        CRLF

                EXIT
MAIN           ENDP
                END         MAIN
```

QUESTION TWO:

{ 12 points }

Choose the BEST correct answer for each of the following questions and **write its letter symbol down in the table shown below**

- 1) The flag that indicates whether the instruction result contains odd or even number of ONES is:
a) zero b) sign **c) Parity** d) Overflow e) None
- 2) The 8-bit value 11111010 represents unsigned decimal value ____ and signed decimal value ____
a) 6, -6 **b) 250, -6** c) 250, -250 d) 6, -250 e) None
- 3) If a computer has 24 data lines and 2 GB of main memory, the minimum number of address lines is
a) 21 **b) 31** c) 32 d) 60 e) None
- 4) The statement that produces syntax error during assembly process is:
a) INC AX b) MOVZX EBX, CL c) ADD AX, BX
d) MOVSX EBX, EAX e) MOV DH, 20H
- 5) The statement that produces syntax error during assembly process is:
a) MOV AX, [EBX] b) MOVZX EBX, CL c) INC AX
d) MOV [EBX], [EAX] e) None
- 6) The register that must be used to store the loop repetition counter when using LOOP instruction is:
a) ECX b) EBX c) ESI d) EIP e) None
- 7) If the physical address is 20000 and the offset value is 39C0, then the segment value will be:
a) 59C0 b) 239C0 **c) 1C64** d) 1C640 e) None
- 8) The register containing the offset address of the next instruction to be executed:
a) ESI b) EBX c) ECX **d) EIP** e) None
- 9) The type of the destination operand used in the instruction: MOV [EBX], BX; is:
a) indirect b) Direct c) Indexed d) Register e) None
- 10) The step in the instruction cycle that determines where to store the result is:
a) STORE RESULT **b) INSTRUCTION DECODE** c) NEXT INSTRUCTION
d) OPERANDS FETCH e) None
- 11) The statement that produces syntax error during assembly process is:
a) MOV AX, [EBX] b) XCHG BX, CX **c) INC [EAX]**
d) MOV BX, [EAX] e) MOV ECX, 20H
- 12) The instruction used to decrement a word variable pointed to by a register ESI is:
a) DEC WORD PTR [ESI] b) DEC ESI c) DEC [ESI]
d) DEC word ptr [ESI], 1 e) None

Question #	1	2	3	4	5	6	7	8	9	10	11	12
Answer	C	B	B	D	D	A	C	D	A	B	C	A

QUESTION THREE:

{ 18 points }

- (a) Write the data definitions and the instructions needed to prompt the user and enter from the keyboard your address consisting of up to 64 characters.

```
M1    BYTE    "ENTER YOUR ADDRESS UPTO 64 CHARS: ",0
ADDR  BYTE    65 DUP (?)
      LEA      EDX, M1
      CALL     WRITESTRING
      LEA      EDX, ADDR
      MOV      ECX, LENGTHOF ADDR
      CALL     READSTRING
```

- (b) Given: TX QWORD 12 dup(?); Write the needed instructions to store in AX register the sum of all bytes in TX. (Hint: you need to use a pointer to TX) .

```
      MOV      ECX, SIZEOF TX
      LEA      ESI, TX
      MOV      AX, 0
LG:   MOVSB    BX, byte ptr [ESI]
      ADD      AX, BX
      INC      ESI
      LOOP     LG
```

- (c) Given the following data definitions: UU byte "AB 45;\$df ghre...?9XYZ"; Write the needed instructions to display at the beginning of a new line the characters in UU in reverse order separated by space.

```
      MOV      ECX, SIZEOF UU
      MOV      EBX, SIZEOF UU - 1
      CALL     CRLF
L6:   MOV      AL, UU[EBX]
      CALL     WRITECHAR
      MOV      AL, 20H
      CALL     WRITECHAR
      DEC      EBX
      LOOP     L6
```

QUESTION FOUR:

[13 pts]

Carefully study the following Assembly code, and then answer the two parts of question

```

UT    DWORD    725A9033H, 5C6F3A49H, 69CB3A2CH, 248F7C39H
T1    SBYTE    9AH, 22H, 9CH, 0C4H, "ABFC6789", 5EH, 3BH, 80H, 1FH
T2    WORD     6F7FH, 6ACAH, 81CFH, 69CFH, 3459H, ?, ?, 7CH
FFF    EQU     $-T1
GH

```

```

MOV    AX, WORD PTR UT+6
MOV    BX, WORD PTR T2-2
MOV    CH, SIZEOF T2
MOV    CL, TYPE UT
MOV    DX, WORD PTR T1
MOVSBX DI, T1[3]

```

Part#1: Execute the above instructions and answer each of the following 5 questions

- 1) The value assigned to the constant name FFF is:
a) 25 b) 17 **c) 20H** d) 20 e) None
- 2) The register BX will contain:
a) 803BH b) 801FH c) 3B80H **d) 1F80H** e) None
- 3) The register AX will contain:
a) 3A49H **b) 5C6FH** c) 6F5CH d) 493AH e) None
- 4) The register CX will contain:
a) 1004H b) 1604H c) Unknown d) 0804H e) None
- 5) The register DI will contain:
a) 009CH b) 00C4H **c) FFC4H** d) FF9CH e) None

Part#2: Answer each of the following 6 questions as required:

- 6) The instruction that makes EBX point to the first element in UT is **LEA EBX, UT**
- 7) The instruction that stores in ECX the number of words in UT is **MOV ECX, SIZEOF UT/2.**
- 8) The instruction that extends the first word in T2 and store it in ECX is **MOVZX ECX, T2**
- 9) The instruction that stores zero in the last byte of T1 is **MOV T1[sizeof T1-1], 0**
- 10) The statement that defines a constant GH equals to the total number of bytes in all above-mentioned definitions is **GH EQU \$ - UT.**
- 11) The three instructions to swap the last two words in T2 are
MOV AX, T2[SIZEOF T2-2]
XCHG AX, T2[SIZEOF T2-4]
MOV T2[SIZEOF T2-2], AX

Name: **BBBBBBBBBBBBBBBBBB**

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ITCS 242: ASSEMBLY PROGRAMMING

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FIRST TEST

QUESTION ONE: Write a complete assembly program that:

[20 pts]

- Defines an array YES consisting of 64 elements of signed words.
- Randomly generate 64 words and store the generated values in array YES.
- Displays in HEX all elements of array YES as bytes separated by a space.
- Subtract 360H from each element of array YES.
- Display all elements of array YES in signed decimal separated by colon.

```
                INCLUDE Irvine32.inc
                .DATA
YES             SWORD      64 dup(?)

                .CODE
MAIN            PROC
                CALL        RANDOMIZE
                ; Generating random numbers and storing them in array YES
                MOV         ESI, OFFSET YES
                MOV         ECX, LENGTHOF YES
L0:             CALL        RANDOM32
                MOV         [ESI], ax
                ADD         ESI, 2
                LOOP        L0
                CALL        CRLF
                ; Display elements of array YES as bytes (HEX) separated by space
                MOV         ESI, OFFSET YES
                MOV         EBX, TYPE YES / 2
                MOV         ECX, LENGTHOF YES * 2
                CALL        DUMPHEX
                CALL        CRLF
                ; Subtract 360H from each element of array YES
                MOV         ESI, 0
                MOV         ECX, LENGTHOF YES
L9:             SUB         YES[ESI], 360H
                INC         ESI
                LOOP        L9
                ; Display all elements of YES in signed decimal separated by :
                MOV         ECX, LENGTHOF YES
                MOV         ESI, 0
L2:             MOVSD       EAX, YES[ESI]
                CALL        WRITEINT
                MOV         AL, ":"
                CALL        WRITECHAR
                INC         ESI
                LOOP        L2
                CALL        CRLF

                EXIT
MAIN            ENDP
                END         MAIN
```

QUESTION TWO:

{ 12 points }

Choose the BEST correct answer for each of the following questions and **write its letter symbol down in the table shown below**

- 13) If the physical address is 20000 and the offset value is 39C0, then the segment value will be:
 a) **1C64** b) 239C0 c) 59C0 d) 1C640 e) None
- 14) The register containing the offset address of the next instruction to be executed:
 a) ESI b) EBX c) ECX **d) EIP** e) None
- 15) The type of the destination operand used in the instruction: MOV [EBX], BX; is:
 a) **indirect** b) Direct c) Indexed d) Register e) None
- 16) The step in the instruction cycle that determines where to store the result is:
 a) STORE RESULT **b) INSTRUCTION DECODE** c) NEXT INSTRUCTION
 d) OPERANDS FETCH e) None
- 17) The statement that produces syntax error during assembly process is:
 a) MOV AX, [EBX] b) XCHG BX, CX **c) INC [EAX]**
 d) MOV BX, [EAX] e) MOV ECX, 20H
- 18) The instruction used to decrement a word variable pointed to by a register ESI is:
 a) DEC [ESI] b) DEC ESI **c) DEC WORD PTR [ESI]**
 d) DEC word ptr [ESI],1 e) None
- 19) The flag that indicates whether the instruction result contains odd or even number of ONES is:
 a) **Parity** b) sign c) zero d) Overflow e) None
- 20) The 8-bit value 11111010 represents unsigned decimal value ____ and signed decimal value ____
 a) 6, -6 **b) 250, -6** c) 250, -250 d) 6, -250 e) None
- 21) If a computer has 24 data lines and 2 GB of main memory, the minimum number of address lines is
 a) 21 **b) 31** c) 32 d) 60 e) None
- 22) The statement that produces syntax error during assembly process is:
 a) INC AX b) MOVZX EBX, CL c) ADD AX, BX
d) MOVSX EBX, EAX e) MOV DH, 20H
- 23) The statement that produces syntax error during assembly process is:
 a) MOV AX, [EBX] b) MOVZX EBX, CL c) INC AX
d) MOV [EBX], [EAX] e) None
- 24) The register that must be used to store the loop repetition counter when using LOOP instruction is:
 a) ESI b) EBX **c) ECX** d) EIP e) None

Question #	1	2	3	4	5	6	7	8	9	10	11	12
Answer	A	D	A	B	C	C	A	B	B	D	D	C

QUESTION THREE:

{ 18 points }

- (a) Given: `TXH QWORD 16 dup (?)`; Write the needed instructions to store in `EBX` register the sum of all words in `TX`. (Hint: you need to use a pointer to `TXH`).

```
MOV     ECX, SIZEOF TXH / 2
LEA     ESI, TXH
MOV     EBX, 0
GH: MOVSBX    EAX, word ptr [ESI]
ADD     EBX, EAX
ADD     ESI, 2
LOOP    GH
```

- (b) Given an array `ARR byte ?, ?, ...`; Write the needed instructions to randomly generate values in the range from 65 to 90 inclusively and store them in array `ARR`.

```
MOV     ECX, SIZEOF ARR
LEA     EBX, ARR
MOV     EAX, 26
L2: CALL    RANDOMRANGE
ADD     EAX, 65
MOV     [EBX], AL
INC     EBX
LOOP    L2
```

- (c) Given an array `pack sdword 24F654CH, 35AC679EH, ...`; Write the needed instructions to unpack each element in array `pack` into two words and store them in array `YES`. You have to define the array `YES`.

```
YES    SWORD    lengthof pack * 2    DUP (?)
```

```
MOV     ECX, LENGTHOF PACK
MOV     ESI, 0
LG: MOV     AX, WORD PTR PACK [4*ESI]
MOV     YES [4*ESI], AX
MOV     AX, WORD PTR PACK [4*ESI+2]
MOV     YES [4*ESI+2], AX
INC     ESI
LOOP    LG
```

QUESTION FOUR:

[13 pts]

Carefully study the following Assembly code, and then answer the two parts of question

```

UT    DWORD    725A9033H, 5C6F3A49H, 69CB3A2CH, 248F7C39H
T1    SBYTE    9AH, 22H, 9CH, 0C4H, "ABFC6789", 5EH, 3BH, 80H, 1FH
T2    WORD     6F7FH, 6ACAH, 81CFH, 69CFH, 3459H, ?, ?, 7CH
FFF    EQU     $-T1
GH

```

```

MOV    AX, WORD PTR UT+6
MOV    BX, WORD PTR T2-2
MOV    CH, SIZEOF T2
MOV    CL, TYPE UT
MOV    DX, WORD PTR T1
MOVSX  DI, T1[3]

```

Part#1: Execute the above instructions and answer each of the following 5 questions

- 12) The register AX will contain:
 a) 3A49H **b) 5C6FH** c) 6F5CH d) 493AH e) None
- 13) The register CX will contain:
a) 1004H b) 1604H c) Unknown d) 0804H e) None
- 14) The register DI will contain:
 a) 009CH b) 00C4H **c) FFC4H** d) FF9CH e) None
- 15) The value assigned to the constant name FFF is:
 a) 25 b) 17 **c) 20H** d) 20 e) None
- 16) The register BX will contain:
 b) 803BH b) 801FH c) 3B80H **d) 1F80H** e) None

Part#2: Answer each of the following 6 questions as required:

- 17) The instruction that extends the first word in T2 and store it in ECX is **MOVZX ECX, T2**
- 18) The instruction that stores zero in the last byte of T1 is **MOV T1[sizeof T1-1], 0**
- 19) The statement that defines a constant GH equals to the total number of bytes in all above-mentioned definitions is **GH EQU \$ - UT.**
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